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RESEARCH ARTICLE

Awareness and Adoption Behavior of Vegetable Farmers on Safe Pesticide Handling Practices

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ABSTRACT

The study was executed in the Theni district of Tamil Nadu by selecting 4 major vegetable-producing blocks, 100 vegetable farmers have been drawn proportionately and the data were gathered using a well-structured and pre-tested interview schedule and analyzed using SPSS software. The study aims at assessing and comparing the awareness and adoption levels of vegetable farmers regarding safe pesticide handling practices. Among the selected vegetable farmers, a majority (73%) of the vegetable farmers have a medium level of awareness about safe pesticide handling practices. At the same time, majority (51%) of the vegetable farmers have a low level of adoption. It can be interpreted from the study that most vegetable farmers were aware, but they were not properly adopting safe pesticide handling practices.

Keywords: *Awareness; Adoption; Farmers; Pesticides; Safe handling*

INTRODUCTION

India is one of the top nations for the widespread usage of pesticides to control diseases and insect pests. Pesticides account for a disproportionately large portion of the input costs in vegetable cultivation. When growing a crop, pesticides are inputs that are used to keep pests under control. Kateregga (2012), Jansen and Dubois (2014). The health of people has been significantly affected by these toxins. Pesticidal residue consequences result from the overuse of agricultural chemicals. One of the biggest issues facing man is the poisoning of food stocks. The consumer is really at risk for pesticide exposure from food contamination, and exaggerating farmers' indiscriminate use of pesticides results in excessive chemicalization of agriculture, which has several negative effects, including the development of pesticide resistance in the target pest species, the resurgence of pests, secondary pest outbreaks, residue

in food and feed, etc. Farmers are using heavy chemicals for a small tolerance to pests. Damte and Tabor (2015).

Across the world, 2.5 Lakh to 3.7 Lakh people dies each year due to pesticide poisoning in the agricultural sector globally, especially in developing nations accounting for the majority of these deaths Ajayiet *et al.* (2011). In India, the majority of people are employed in agriculture and are therefore subjected to the pesticides exposure in the agricultural sector.

The effect of chemical pesticide use is more harmful in the case of vegetables. Around 15 percent of total pesticide application in our country is applied to vegetables. Kodandaram *et al.* (2013). About 66 per cent of the total pesticides used in vegetables were dominated by insecticides. In recent times, use of the pesticides in vegetables increased dramatically, which shows the need to reduce the pesticide residue in vegetable foods, since they are a vital source of nutrients. The reason behind this may be due to the lack of awareness among the farmers in selecting the correct pesticides at correct volumes, not adopting the suggested precautionary measures while applying pesticides, and improper pesticide handling practices. Since the present study is focusing on studying the awareness and adoption levels of vegetable farmers regarding safe pesticide handling practices.

MATERIAL AND METHODS

The study was executed in the Theni district of Tamil Nadu by selecting 4 major vegetable-producing blocks in the district i.e., Aundipatti, Chinnamanur Uthamapalayam, and Cumbum. The adopted research design was an "Ex-post facto research design". 100 vegetable farmers have been drawn proportionately by considering the total vegetable farmers count in the selected villages of the selected blocks as samples for collecting the primary data using a well-prepared and pre tested interview schedule which was constructed by the researcher with reference to the safety guidelines suggested by the Directorate of plant protection quarantine and storage. SPSS software was used to code and analyze the acquired data to compute statistical tools such as mean, standard deviation, cumulative frequency, and percentage analysis.

RESULTS AND DISCUSSION

Awareness and adoption level of vegetable farmers about purchasing pesticides

It is proven from Table 1 that, among the selected vegetable farmers, a majority (96%) of the farmers were aware of purchasing pesticides from registered pesticide dealers. Also, ninety two per cent of the farmers adopted this factor. Because even the illiterate farmers were aware that each pesticide shop should get a license from the Department of Agriculture. About 86 per cent of the farmers were aware that banned pesticides should not be used, among which 53 per cent of the farmers adopted it. The reason behind this may be farmers are finding difficulties in differentiating and remembering the names of the banned pesticides. The findings are in line with Jallow *et al*.(2017) and Adesuyi *et al*., (2018).

A majority of the farmers (98 %) are aware of purchasing only the required quantity among which 68 per cent of the farmers adopted it. The residual percent of people may be feeling lazy to purchase every time and also day by day increase in the price of pesticides may also be the reason. Around 86 per cent of the farmers were aware of checking the labels for manufacturing and expiry dates among them 44 per cent of the farmers adopted it. Only half of the farmers were aware of active ingredients even that, 16 percent of farmers adopted the same. Less than half of the farmers were aware of enquiring about a safe harvest period, and only 17 per cent of them have adopted it. Almost all the farmers (99%) are frequently contacting input dealers as an information source. So most of the farmers have blind trust in the input dealers this may the considerable reason behind these crises. Similar results have been obtained by Rajapandi (2020).

Due to the very low level (6%) of awareness about the antidote, none have adopted it. Since checking the packing of the container is a readily observable phenomenon and doesn't require any technical knowledge and skill, Cent percent of the farmers were aware and also adopted the same. The findings are in line with Gill *et al*.(2020) and Pandher *et al*. (2021).

Awareness and adoption level of vegetable farmers about storing pesticides

It is proven from Table 1 that, Cent percent of the farmers were aware and also adopted storing pesticides away from house premises, sunlight, rain, children, and livestock. The findings are contradictory with Kumari *et al*. (2018). The considerable reason behind this is most of the farmers from middle to high levels of experience. Six percent of the farmers are storing pesticides in their homes. 52 per cent of farmers were aware of storing pesticides and herbicides separately, but only 32 per cent of them have

adopted it. About 31 per cent of the farmers were aware of marking the pesticide storage place with warning signs but none of them have adopted it. Among the samples, most of the farmers have not attended training regarding safe pesticide handling this may be the possible reason behind it. Similar results have been reported by Karunamoorthi *et al*. (2011), Blanco *et al*., (2011), Alam *et al.* (2016), Jallow *et al*. (2017) and Pandher *et al*. (2021).

Awareness and adoption level of vegetable farmers about transportation of pesticides

It is proven from Table 1 that, Cent percent of the farmers were aware and also did not carry pesticides along with food, fodder, or other eatables. Most of the farmers (96%) were aware of not carry bulk pesticides on the head or shoulder but nearly half of them (52%) have adopted it properly. More than half of the farmers were having a medium level of risk orientation and this may be the reason for their lethargic pesticide handling practices. Similar results have been reported by Rajapandi (2020).

Awareness and adoption level of vegetable farmers about the application of pesticides

It is proven from Table 1 that, cent percent of the farmers were aware of conducting the spray operations on cool and calm days, spraying in the early morning or evening hours, not to spray just before and immediately after rain, not to smell the spray tank and also cent percent adopted these factors. The considerable reason behind this is most of the farmers from middle to high levels of experience. The findings are in line with Adesuyi *et al*., (2018).

Nearly 98 per cent of the farmers were aware that pesticides should be applied using well-experienced spray man but only 62 per cent of the farmers have adopted it. High spraying cost may be the reason behind it. The findings are on par with Karunamoorthi *et al*. (2011). Nearly three fourth (76%) of the farmers were aware of wearing protective clothing at the time of pesticide application, but only 12 per cent of the farmers have adopted it properly. Similar results have been found by Sosan and Akingbohungbe (2009), Okoffo *et al*., (2016), Adesuyi *et al*., (2018) and Kumari *et al*., (2018). Even though 78 per cent of the farmers were aware of, not to apply over-dose than recommended, half (51%) of the total farmers have adopted it. About 90 per cent of farmers are aware of not eating, drinking, and chewing while applying pesticides, but only 36 per cent of the farmers have adopted it. Similar results have been found by Sosan and Akingbohungbe (2009), Okoffo *et al*.(2016), Adesuyi *et al*. (2018) and Kumari *et al*. (2018). Nearly half of the farmers were educated at a lower middle school level this may the probable reason behind it.

Awareness and adoption level of vegetable farmers after the application of pesticides

It is proven from Table 1 that, cent percent of the farmers were aware about sprayers and buckets should be washed with clean water and detergent or soap after spraying, taking bath and wash the cloths after spraying, washing hands and face with clean water and soap twice before eating. Similar findings have been obtained by Okoffo *et al*. (2016), Kumari *et al*. (2018) and Gill *et al.*(2020). Also, cent percent of the farmers were aware, not to use the containers used for pesticide mixing and application for domestic purposes even after washing, if poisoning symptoms are noticed the patient must consult the doctor along with the container. Among them, the majority of the farmers (94%) have adopted it properly. Because most farmers have a medium level of perception about health risks and this may be considered as the grounds for it. The findings are in synchrony with Adesuyi *et al*. (2018).

Cent percent of the farmers were aware not to use the empty pesticide containers for storing other articles even with that level of awareness, only three fourth of the farmers (74%) have adopted it. The findings are similar to Lawal *et al*., (2005), NPAS (2012), Afari-sefa *et al.,* (2014), Okoffo *et al*., (2016) Jallow *et al*. (2017) and Adesuyi *et al*. (2018). Almost one-third (32%) of the farmers were aware that leftover spray solution should be disposed off at a safer place but only 8 per cent of the farmers have adopted it. The results were in line with Satya sai *et al*., (2019) and Pandher *et al*., (2021). Nearly one-fifth of the farmers (26%) were aware that, the used containers should be crushed and buried deep into the soil but only one per cent of farmers adopted it. The findings were in line with Karunamoorthi *et al*., (2011), Antwi-Agyakwa (2013), Afari-sefa *et al*., (2014) and Adesuyi *et al*., (2018). Nearly half of the farmers were educated at a lower middle school level and also lack training regarding safe pesticide handling, this may be the considerable reason behind it.

Since the awareness about marking the pesticide sprayed plot with flags was very little (8%) none have adopted this factor. Even though two-thirds (66%) of the farmerswere aware of periodical medical checkups, only 12 percent have adopted it. Almost half of the vegetable farmers in the study area were earning a low level of income which may the probable reason for it. The findings are on par with Pandher *et al*. (2021).

Table 1. Awareness and adoption level of farmers regarding safe pesticide handling practices

(n=100)

S.No	Safe handling practices	Awareness		Adoption	
A.	**Purchasing Pesticides**	**No.**	**%**	**No.**	**%**
1.	Purchase only from registered pesticide dealers having a valid license	96	96.00	92	92.00
2.	Pesticides that are banned or restricted to use should not be purchased and used	86	86.00	53	53.00
3.	Purchase only required quantity	98	98.00	68	68.00
4.	Check labels for manufacture and expiry dates	86	86.00	44	44.00
5.	Check labels for active ingredients	50	50.00	16	16.00
6.	Read label for information about antidote	6	6.00	0	0.00
7.	Confirm that the container is well packed and sealed	100	100.00	100	100.00
8.	Enquire about safe harvest period	40	40.00	15	15.00
B.	**Pesticide storage**				
1.	Pesticides must be stored separately away from house premises	100	100.00	94	94.00
2.	Pesticides and Herbicide must be stored separately	52	52.00	32	32.00
3.	The storage place should be away from direct sunlight and rain	100	100.00	100	100.00
4.	The storage place should be away from the reach of children and livestock	100	100.00	100	100.00
5.	Storage place should be marked with warning signs	31	31.00	0	0.00
C.	**Transportation of Pesticides**				
1.	Never carry along with food, fodder, or other eatables	100	100.00	100	100.00
2.	Never carry bulk pesticides on the head or shoulder	96	96.00	52	52.00
D.	**Application of pesticides**				
1.	Apply pesticides using well experienced spray man	98	98.00	62	62.00
2.	Should not enter into the field without wearing protective clothing at the time of pesticide application	76	76.00	12	12.00
3.	Never apply over-dose and high concentrations than recommended	78	78.00	51	51.00
4.	Spray operations should be conducted on cool & calm days rather than on hot sunny and strong windy days	100	100.00	100	100.00
5.	Spray in the early morning or evening hours	100	100.00	100	100.00
6.	Avoid spraying just before and immediately after rain	100	100.00	100	100.00
7.	Never eat, drink, and chew while applying pesticides	90	90.00	36	36.00
8.	Do not smell the spray tank	100	100.00	100	100.00
E.	**After pesticide application**				

1.	After application sprayer and buckets should be washed with clean water and detergent or soap	100	100.00	100	100.00
2.	Take a bath and wash the cloths after spraying	100	100.00	100	100.00
3.	The container used for pesticide mixing and application should not be used for domestic purposes even after washing	100	100.00	94	94.00
4.	Mark with flags to mark the pesticide sprayed plot	8	8.00	0	0.00
6.	Left over spray solution should be disposed off at a safer place	32	32.00	8	8.00
7.	The used containers should be crushed and buried deep into the soil away from water sources	26	26.00	1	1.00
7.	Wash hands and face with clean water and soap twice before eating.	100	100.00	100	100.00
8.	Empty containers of pesticides should not be re-used for storing other articles	100	100.00	74	74.00
9.	On observing poisoning symptoms give the first aid and show the patient to the doctor along with the container.	100	100.00	94	94.00
10.	Periodical medical checkups should be done	66	66.00	12	12.00

Overall awareness and adoption level of vegetable farmers regarding safe pesticide handling practices

It can be represented from Figure 1 that the majority (73%) of the farmers were having a medium level of awareness about safe pesticide handling practices followed by 17 per cent in the high level and 10 per cent in the low-level categories. At the same time, Figure 2 reveals that the majority (51%) of the farmers were lying under the low adoption category followed by the medium (40%) and high (9%) categories. It showcases that most of the farmers are aware of safe pesticide handling practices but not adopting them. Similar results have been found by Sosan *et al*. (2008), Karunamoorthi *et al*. (2011), Antwi *et al*. (2013), Okoffo *et al*.(2016), Adesuyi *et al*.(2018), Satya sai *et al*. (2019) and Rajapandi (2020).

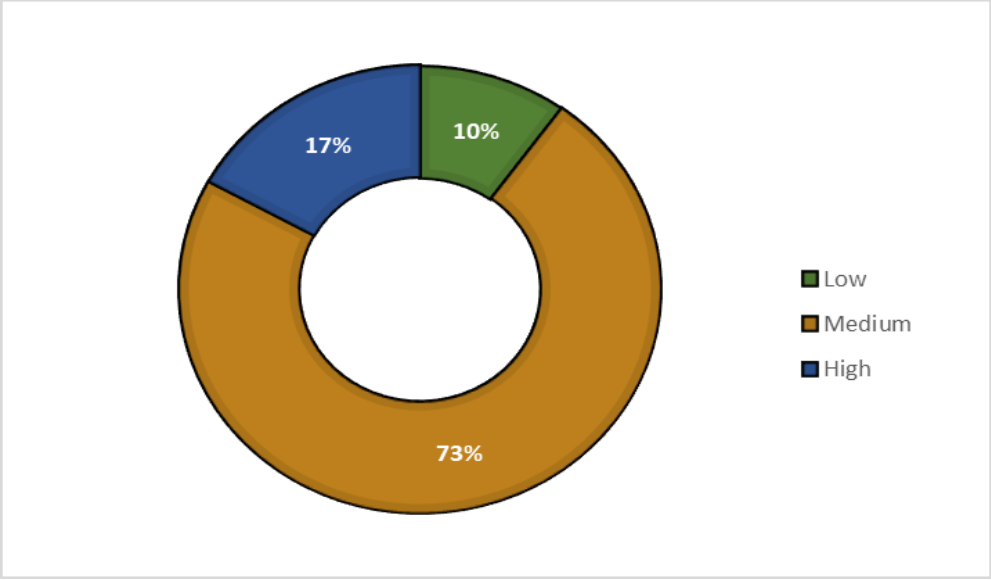

Figure 1. Awareness level of vegetable farmers regarding safe pesticide handling practices

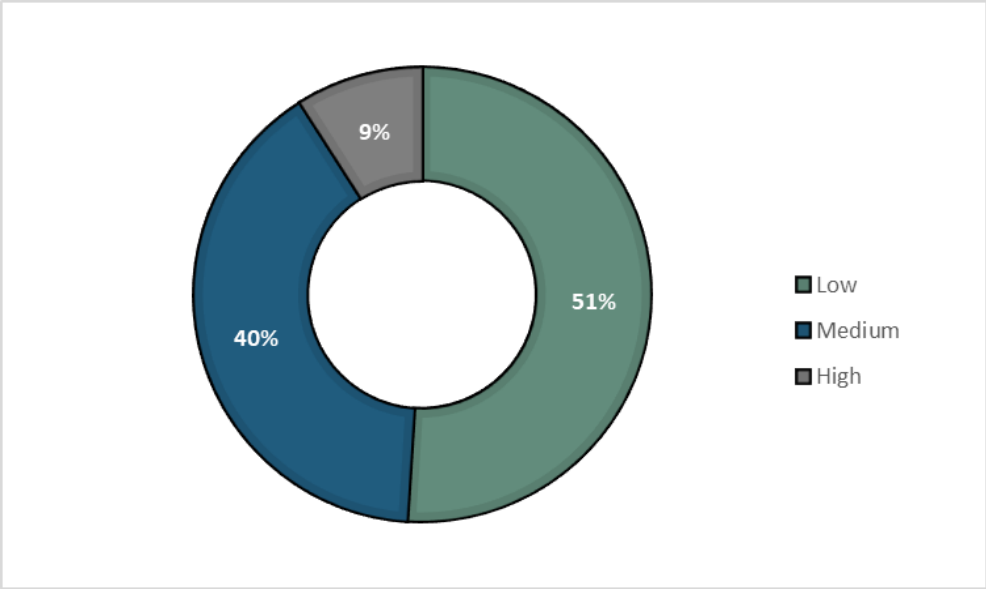

Figure 2. Adoption level of vegetable farmers regarding safe pesticide handling practices

CONCLUSION

The results of the study reveal that majority of the vegetable farmers have a medium level of awareness about safe pesticide handling practices. Because the majority of the vegetable farmers have a medium level of experience, perception of health risks, social participation, and innovativeness, these may be the probable reasons for the medium level of awareness. At the same time, the majority of the vegetable farmers have a lower adoption level. The considerable reasons behind this crisis are most vegetable farmers have not attended training programs on the safe application of pesticides, are educated at a lower middle school level, and belong to the low-income category. It can be inferred from the study that most vegetable farmers were aware but not properly adopting safe pesticide handling practices. Creating awareness about health hazards due to improper pesticide handling is a valid measure to make the farmers adopt safe handling practices and eradicate lethargy while handling pesticides.

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Ethics statement

No specific permits were required for the described studies because no human or animal subjects were directly involved in this research.

Originality and plagiarism

I have written and submitted entirely original work carried out by me. Also not used the words of others. Id used, that has been cited properly in the reference section.

Consent for publication

All the authors agreed to publish the content.

Competing interests

There was no conflict of interest in the publication of this content

Data availability

All the data of this manuscript are included in the MS. No separate external data source is required. If anything is required from the MS, certainly, this will be extended by communicating with the corresponding author through the corresponding official mail: rockyharry3@gmail.com

Author contributions

The work was carried out in collaboration among all authors. The corresponding author carried out the collection of data, performed statistical analysis and wrote the first draft of the manuscript. The co-authors have guided, read, made corrections and approved the final manuscript.

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